

Haber Process

ammonia

Stage of process	
Raw materials	<ul style="list-style-type: none"> Nitrogen from the air Hydrogen from methane CH₄
Catalysed equation	<ul style="list-style-type: none"> $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)}$ Physical conditions required: high pressure 200-1000 atm and high temperature 400°C
Process to convert raw materials into reactants	<ul style="list-style-type: none"> Methane and steam react to produce hydrogen gas $\text{CH}_{4(g)} + \text{H}_2\text{O}_{(g)} \rightarrow \text{CO}_{(g)} + 3\text{H}_{2(g)}$ Air converts some hydrogen to steam $4\text{N}_{2(g)} + \text{O}_{2(g)} + 2\text{H}_{2(g)} \rightarrow 2\text{H}_2\text{O}_{(g)} + 4\text{N}_{2(g)}$ Carbon monoxide is oxidized by steam to make CO_{2(g)} $\text{CO}_{(g)} + \text{H}_2\text{O}_{(g)} \rightarrow \text{CO}_{2(g)} + \text{H}_2(g)$ <p>Potassium carbonate solution is used to scrub the CO_{2(g)} - removal of CO₂ - so it minimizes environmental impact.</p>
Getting product – NH _{3(g)}	<ul style="list-style-type: none"> Ammonia is liquefied (liquefaction) or dissolved in water $\text{NH}_{3(g)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{NH}_4\text{OH}_{(aq)}$
NH _{3(g)} is used for...	<ul style="list-style-type: none"> To make fertilizers To make nitric acid To make nylon

